Major Findings and Recommendations

San Joaquin River Valley CalSim II Model Review

CALFED Science – California Water & Environmental Modeling Forum

17 January 2006

Review Panel Members

- David Ford (David Ford Consulting Engineers)
- Les Grober (Central Valley Regional Water Quality Control Board)
- Thomas Harmon (University of California, Merced)
- Jay R. Lund (Chair) (University of California, Davis)
- Daene McKinney (University of Texas, Austin)

Panel Charge

- *Part I: Merits of recent work compared to prior representations*
  1. In what ways are these new representations more accurate than prior representations?
  2. In what ways are these new representations less accurate than prior representations?
  3. In what ways would CalSim II results using these new representations consistently differ from the prior model?
  4. Are the new representations expected to lead to any systematic bias in CalSim II results?

Panel Charge – Cont.

- *Part II. Improvements to the recent work*
  5. How well are the new representations and their underlying data documented? What additional documentation should be prepared?
  6. How well have the new representations and their underlying data been tested? What additional testing should be performed?
  7. What is the accuracy expected and what are major errors remaining (if any) in the representation of the San Joaquin Valley?
  8. How might the new representations be improved?

So far …

- Workshop August 4
- Public comments (email, written, oral)
- Panel discussions with modelers, August 5
- Internal drafts by panel members and group
- More discussions and clarifications with modelers
- Preliminary presentation of results (September 30)
- More discussions and clarifications with modelers
- Public Review Draft (November 20)
- Preferred receipt date for comments (December 15)
- Last of 4 comments received (December 30)
- Final report, presentation, and Q&A (Today)
- Relieved panel members (Tomorrow)

Comments received on Draft Report

- 4 sets of written comments
- Overall merit of new representation relative to the old
- Quantitative error / uncertainty estimate
- User's Guide
  - Appropriate applications
  - Accuracy estimate of different applications

Thanks to …

- USBR staff and consultants
- Public commentors
- CALFED and Modeling Forum overseers

Today's Workshop Objectives

- Presentation of FINAL Panel Report findings and recommendations
- Questions, Answers, and Comments

Major Review Panel Findings

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Overall

"We found that the new version of the model is improved, in many ways, over the older model. However, the new version has weaknesses, detailed herein. These are weaknesses in the sense of imperfections rather than in the sense of fatal flaws that render a model useless."

Model Endorsements

"Some readers will hope … for an explicit endorsement or condemnation of the model. They will not find it. The panel does not in any way certify or endorse the model presented. On the other hand, we do not disapprove of or discourage its use by knowledgeable users.

Users must take responsibility for model selection and application, and they must accept the responsibility for decisions that they make with information produced by the model. Relying on an external body to provide a blanket endorsement covering all possible applications is a dangerous practice. …"

Model Endorsements (con't)

"Some have asked this review panel to distinguish "appropriate" from "inappropriate" uses of the model. … [This] presumes too much of a review panel and (in our view) reflects a misunderstanding of models and their value for water management. … It falls to the users and critics of specific model applications to scrutinize and interpret model results in the context of a particular application. … The thought involved in a model's application and the interpretation of its results is typically more important than the inner workings of the model alone. … Thus, it must remain beyond the purview of a general model review to declare before the fact and in general terms what is appropriate use and what is not."

Eastside Hydrology and Operations

"The new Eastside hydrology and operations representation is methodologically superior to the older model, but retains significant gaps present in the old model, particularly the lack of explicit groundwater representation. The new representation has involved an updated examination of hydrology and operations, incorporating new gage and local data and detailed discussions with many local water managers and operators. More testing has been done of this new representation than has been documented."

Eastside Water Demands

"The GIS/land-use based demand accounting for the eastside is an improvement in methodology. This method will be more accurate if sufficiently accurate inputs are used and the model's parameters are well estimated. However, whether this actually is an improvement in the analysis is difficult to determine. The procedure that lumps errors and uncertainties into estimates of groundwater pumping obscures gains in accuracy."

San Joaquin River Salinity

"The new representation of mainstem San Joaquin River Salinity is a substantial advance over the older "Kratzer equation" representation. Under most circumstances, the newer model will be more accurate. While providing a more physical basis for the model and much greater flexibility to represent operational and water implications of management actions, the new representation also requires more data for mainstem inflows and diversions of water and salts than is currently available…

San Joaquin River Salinity

… simplified or incorrect input data may contribute to inaccurate model results that mask improvements in model results that would otherwise been obtained through the improved model representation."

San Joaquin River Salinity

"In absolute terms the new representation systematically underestimates salinity due to:

1) use of incomplete data sets (lacking critically dry years)
2) lack of consideration of variability (e.g., operators responding to field conditions, rather than mean field conditions); and
3) biased calibration of Maze electrical conductivity (EC)."

San Joaquin River Salinity

"This underestimate of salinity causes underestimates of releases from New Melones Reservoir that in turn leads to overestimated water availability to entities dependent on New Melones storage. We think these problems can be largely resolved. Bias in estimates using the prior representation was not extensively examined in this review."

Documentation

"The documentation for these new representations in the model is superior to those available for previous CalSim II studies and development efforts. …

Nevertheless, the present documentation and testing alone are not sufficient to provide users of the model or model results with a complete reasonable basis for understanding the general accuracy and limitations of CalSim II results."

Testing, Quality Control, and Quality Assurance

"Testing of the new elements of the model is significantly superior to those available for previous CalSim II studies, including the older CalSim model of the San Joaquin River System. However, at a scientific level, CalSim II work fails to adequately report technical results that would give knowledgeable readers some sense of the quality, accuracy, sensitivity, or uncertainty present in the results."

Closure Terms for Water and Salinity Balances

"Closure terms should be explicit."

Groundwater

"Groundwater is the most important process not included in the newer model, and was absent from previous models."

Loss rates

"In many cases, loss and return flow rates have been taken directly from older model studies without the re-examination and scrutiny that has been applied to other areas of the new representations."

Westside Demands, Hydrology, and Drainage Flows

"Westside water demands were not part of the package of changes made to the CalSim II model. Westside demands and drainage flows have important implications for the San Joaquin River and should be represented in ways consistent with Eastside demands, operations, and flows."

Fundamental Data

"Modeling rests on data. Many major uncertainties and gaps in modeling this system arise not from the conduct of the modeling effort, but from a long-standing narrowness of scope for the CalSim II model and accompanying limited regional data development."

Uncertainty in model results

"Model results are always somewhat uncertain. All models have a general level of error or "noise" in model results, below which it is not particularly useful to interpret results."

"…error estimates of model results should be especially useful in guarding against over-interpreting (or under-interpreting) model results and identifying assumptions in greatest need of additional refinement and data."

Future Levels of Development

"The data in the model being reviewed is for 2001 level of development and the model was calibrated for such recent conditions. However, policy and planning applications of the model will be for future conditions."

Major Review Panel Recommendations

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Immediate-Term (6 months) Recommendations

- Expansion and Improvement of Presented Model Documentation
- Error Analysis Studies
- Examination and Re-Calibration of Maze EC Predictions and Resulting New Melones Operations

Longer-Term Recommendations

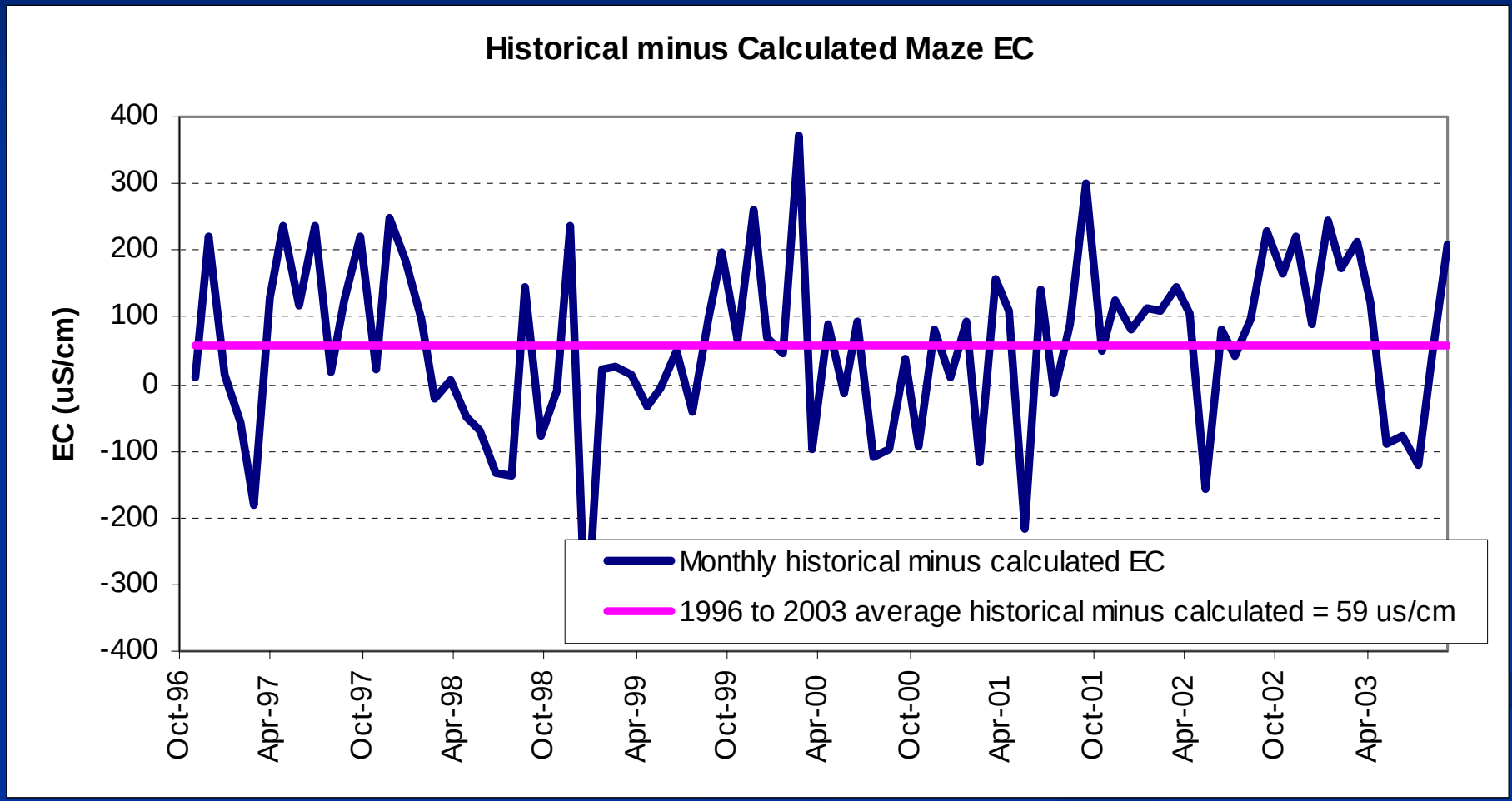
- CalSim Development Plan
- "Absolute" vs. "Comparative" Modeling Expectations
- Protocols for Documentation and Testing
- Groundwater and Westside Components
- Data Development

Questions?

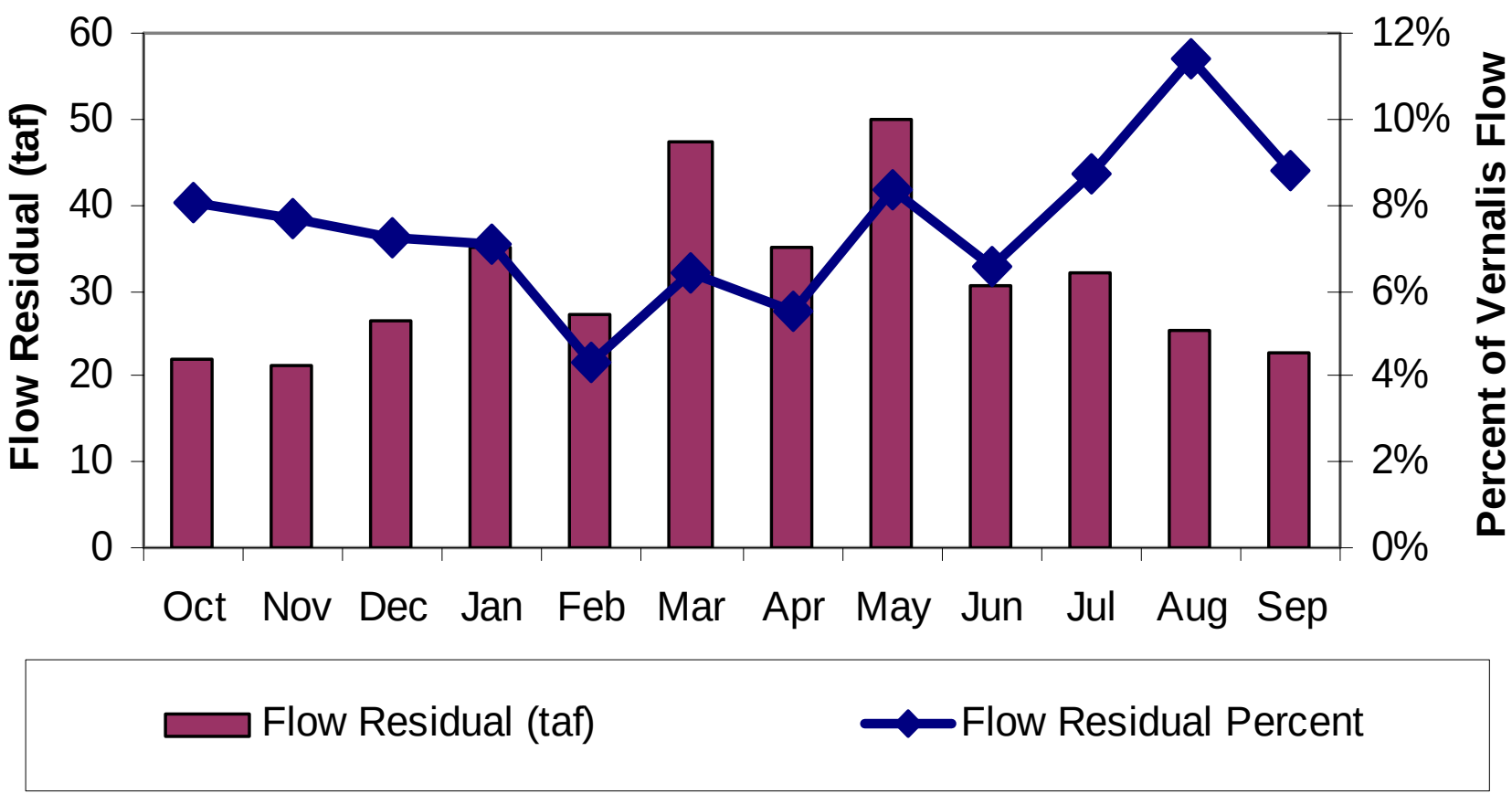
Summary Statistics: Historical versus Calibration Period

	Historical Record 1901 to 2004	Calibration Period 1997 to 2003
	Unimpaired flow (million acre-feet per year)	
Mean	3.34	3.44
Median	3.24	3.38
Standard Deviation	1.31	1.19
Skewness	0.63	1.04
Minimum	0.84	2.20
10th Percentile	1.89	2.28

Historical minus Calculated Maze EC



Flow Residuals at Vernalis (actual flows minus calculated loads)



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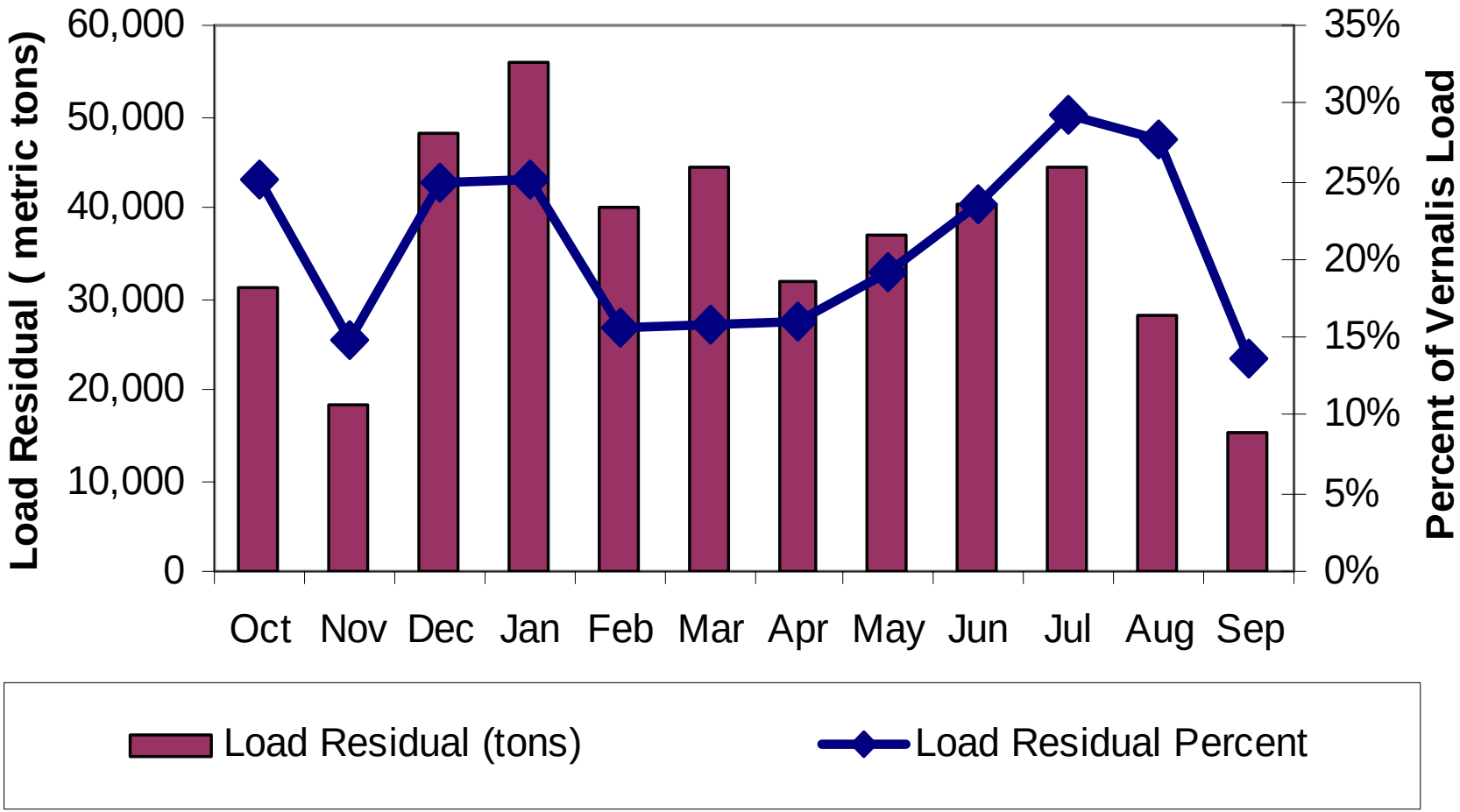
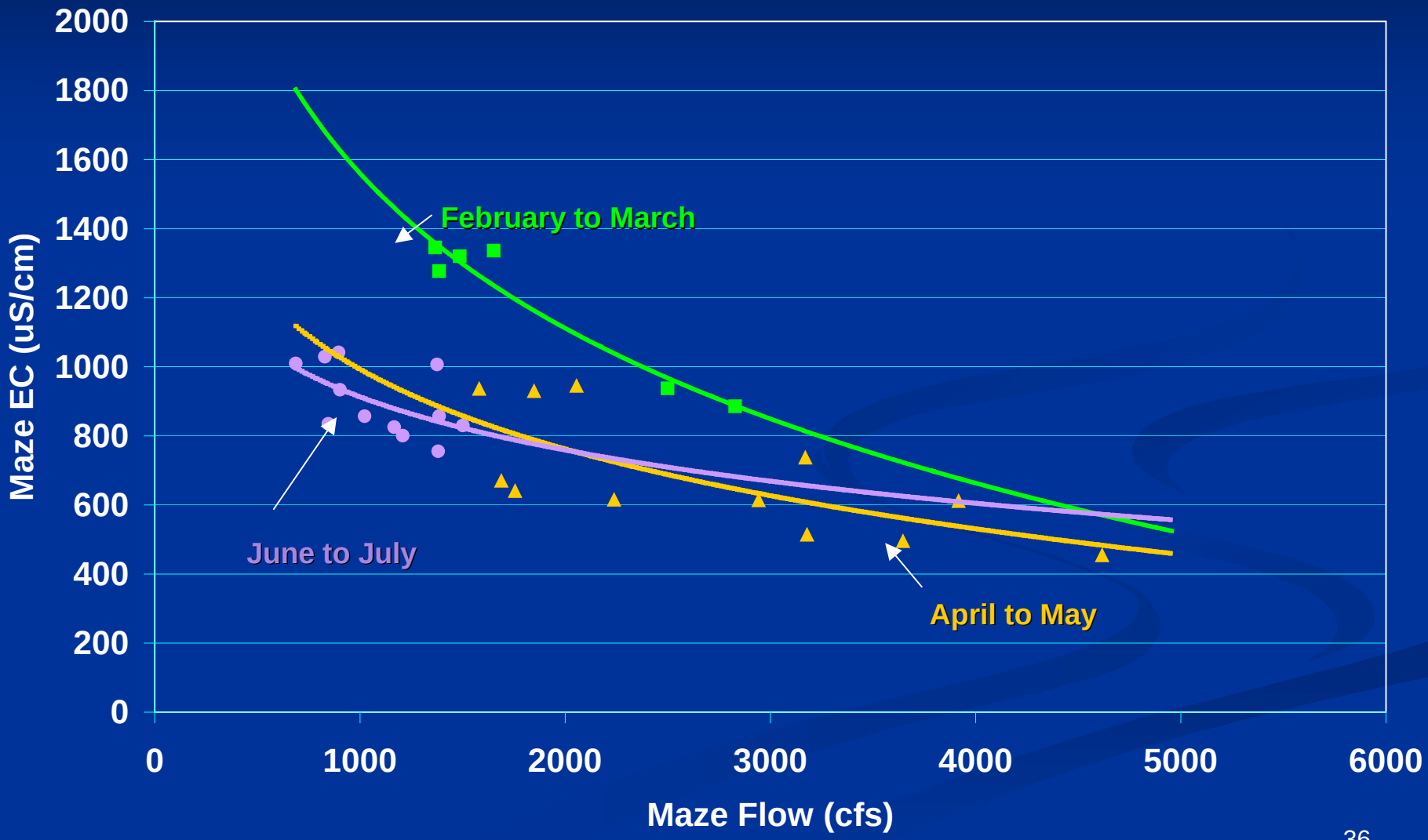


Flow versus EC Calibration at Maze



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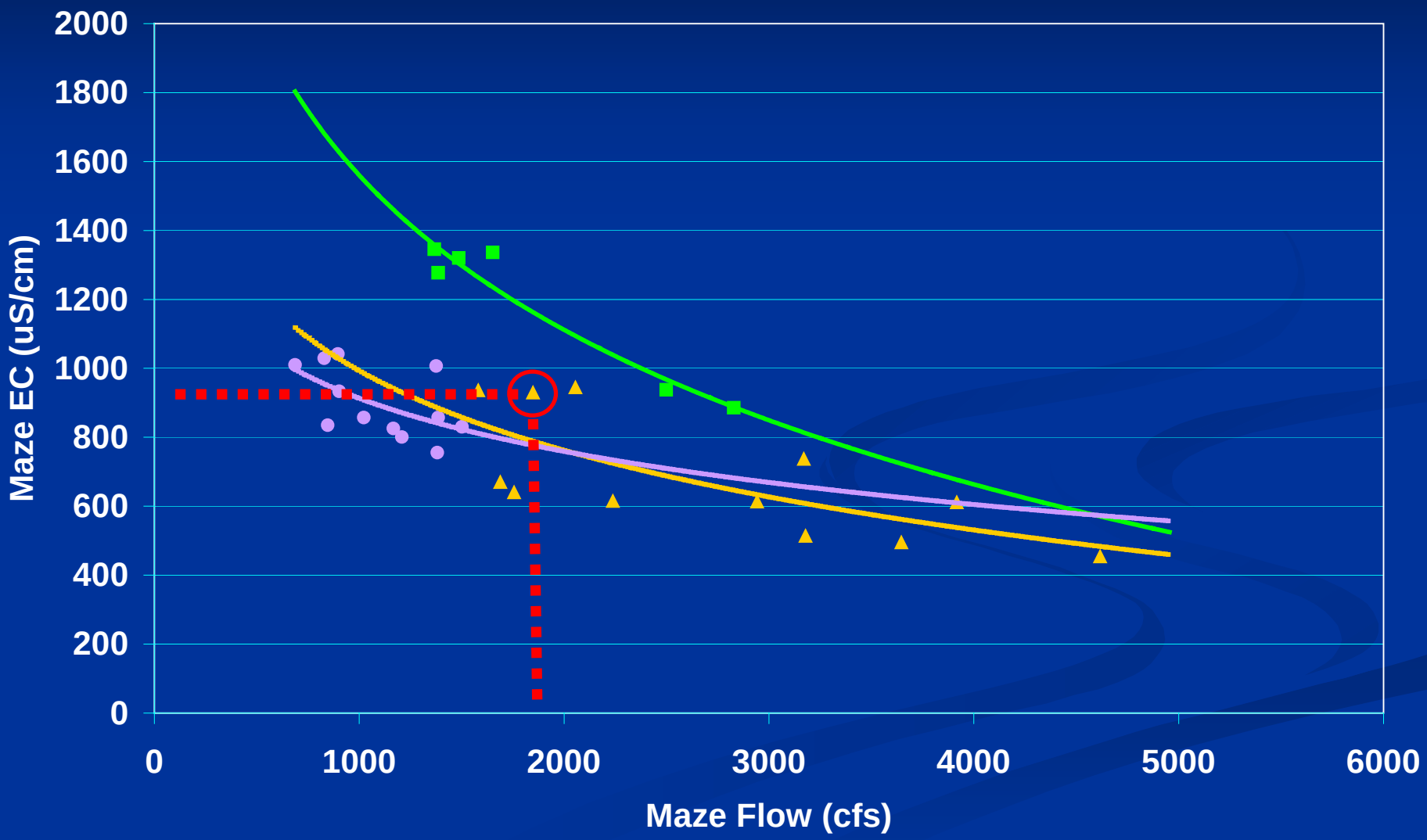

Flow versus EC Calibration at Maze